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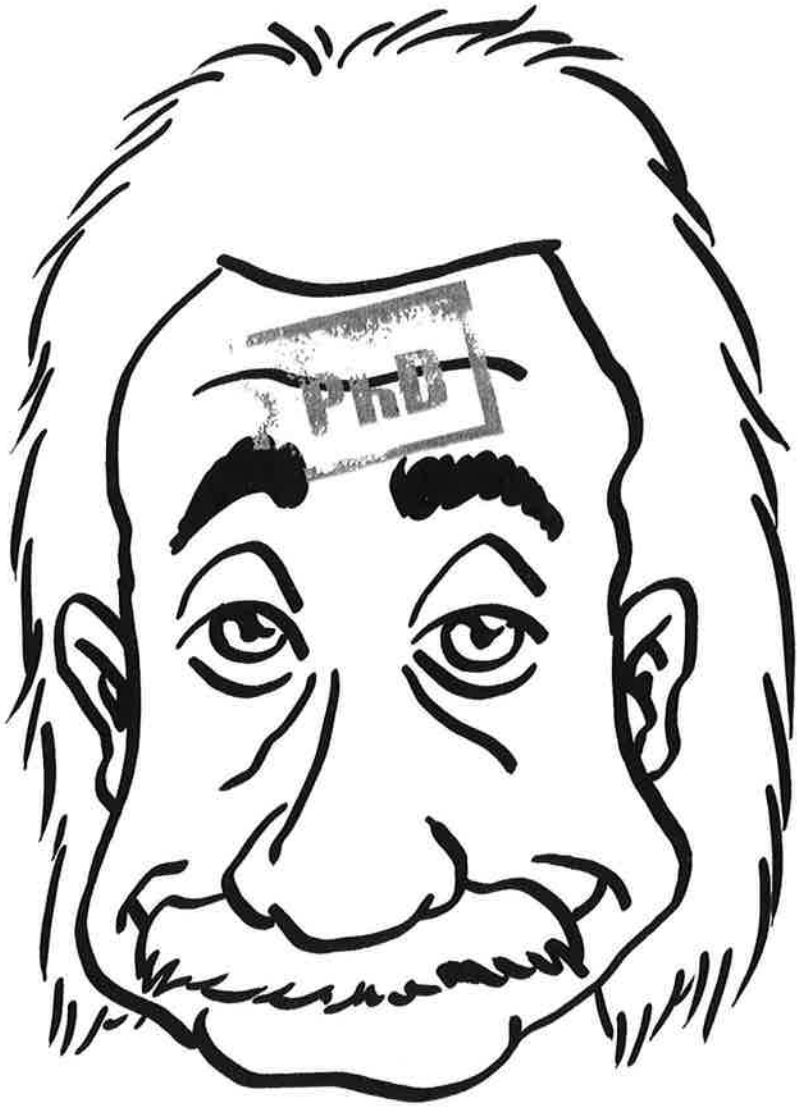

"The true sign of intelligence is not knowledge, but imagination"

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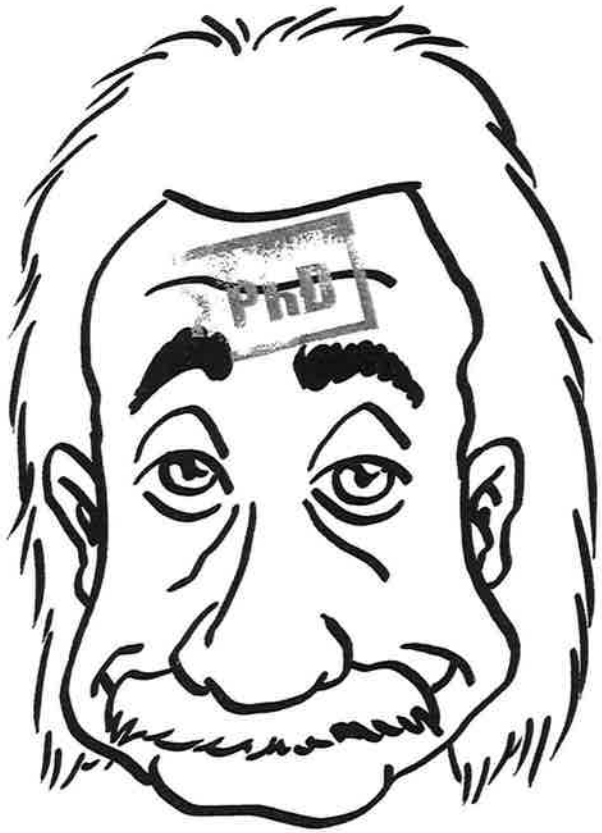

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Development of a test set-up to measure large wave-by-wave overtopping masses

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Supervisor(s): Peter Troch

I. Introduction

Overtopping wave energy converters (OWECs) are based on waves running up a slope and overtopping into a reservoir that is emptied into the sea through turbines, generating electricity. The reservoir functions as a buffer for the irregular wave input by keeping a constant water level in the reservoir. This is achieved through an adaptive control of the turbines requiring the prediction of the water mass entering the reservoir wave-by-wave. An experimental test set-up has been designed that is able to measure large individual overtopping masses accurately to support the development of a prediction tool for non-floating sloped OWECs with a slope extending to the sea bottom.

II. Methodology

According to literature [1], the weigh cell measurement technique is considered to be the most accurate for measuring overtopping masses. This technique involves that the overtopped water runs down a chute with a certain length down to a reservoir on a weigh cell, which measures the amount of overtopped water continuously. However, the technique is designed primarily to determine the average overtopping discharge of sea defense structures, involving small overtopping masses. In order to use this technique to measure large wave-by-wave overtopping masses, some improvements have been implemented.

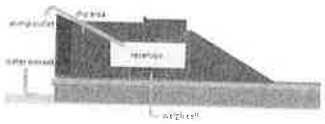

Figure 1. Drawing of improved test set-up including components of weigh cell measurement technique.

The chute was shortened in order to measure wave-by-wave overtopping masses accurately. Furthermore, an accurate correction of the weigh cell signal for the time intervals corresponding to pumping was carried out so that individual overtopping masses during pumping are also accurately derived. Finally, an overtopping detection system was installed, which identifies at what time a wave overtops the crest of the structure. Figure 1 shows a side view of the improved test set-up.

III. Conclusions

By implementing the suggested improvements, the test set-up was was able to measure wave-by-wave overtopping volumes accurately.

Acknowledgments

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References

[1] Kortenhaus A. et al, *Laboratory effects and other uncertainties in wave overtopping measurements*, Proc. 29th Int.Conf. on Coastal Engng, Lisbon, 2004a.

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